******* GREEN FROG *******

***** NORMALIZING AND CONTACT RATE FACTORS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT (AND LENGTH)													
McAlpine & Dilworth 1989	B	B	-	-	49.1	20.0 SD	g (73 mm SVL)	25.5	103.5	25	New Brunswick, CAN 1984	marsh	Length measured from snout to vent (SVL); range was from 59-87 mm SVL.
Pough & Kamel 1984	A	B	-	-	70		g				New York		Represents full grown adult; data not presented. Accuracy of value unknown.
Wells 1978 (melanota)	A	M	BR	SU	44	10 SD	g	27	66	36	New York 1973-75	ponds	Breeding (or attempting to breed) males captured in June. Lengths not provided. Estimated from Figure 6.
BODY LENGTH													
Behler & King 1979	A	-	-	-	54-102		mm SVL				NS	NS	Length measured from snout to vent (SVL).
Conant & Collins 1991 (melanota)	A	-	-	-	57-90		mm SVL		108		e c North America	NS	Length measured from snout to vent (SVL).
Conant & Collins 1991 (clamitans)	A	-	-	-	54-75		mm SVL		87		s e c North America	NS	Length measured from snout to vent (SVL).
Martof et al. 1980	-	-	-	-	54-86		mm SVL				Carolinas, Virginia	streams, ponds	Length measured from snout to vent (SVL).
Martof 1956b	A	M	-	-	79.8	8.5 SD	mm SVL		103	344	s Michigan 1948-49	streams, ponds	Mean size of all adults on study area. Length measured from snout to vent (SVL).
	A	F	-	-	80.3	8.9 SD	mm SVL		105	307			
Ryan 1953	A	F	-	-			mm SVL		98		New York 1949-50	streams, ponds	Length measured from snout to vent (SVL).
	A	M	-	-			mm SVL		90				
Smith 1961 (melanota)	A	-	-	-			mm SVL		95		n Illinois	NS	Length measured from snout to vent (SVL).
Wells 1978 (melanota)	A	M	-	-	74.1	0.7 SE	mm SVL	59.0	89.5	104	NS	NS	Sexually mature adults from museum collections. Length measured from snout to vent (SVL).
	A	F	-	-	75.6	0.9 SE	mm SVL	60.0	93.9	74			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
GROWTH RATE													
Martof 1956b	-	B	1	-	33.6	1.08 SD	mm SVL/yr	30.3	36.9	13	s Michigan 1948-49	streams, ponds	Annual growth for transformed frogs in size classes: (1) 30-40; (2) 40-50; (3) 50-60; (4) 60-70; (5) 70-80; (6) 80-90; and (7) 90-100. Most growth occurs between mid May and mid September. Length measured from snout to vent (SVL).
	-	B	2	-	28.6	1.10 SD	mm SVL/yr	25.5	31.7	25			
	-	B	3	-	23.5	0.79 SD	mm SVL/yr	21.2	25.8	19			
	-	B	4	-	17.8	0.92 SD	mm SVL/yr	15.1	20.5	16			
	-	B	5	-	8.0	0.58 SD	mm SVL/yr	6.2	9.8	13			
	-	B	6	-	4.3	0.49 SD	mm SVL/yr	2.8	5.8	12			
	-	B	7	-	2.1	0.42 SD	mm SVL/yr	0.5	3.7	7			
WEIGHT AT METAMORPHOSIS													
Pough & Kamel 1984	-	-	-	-	3		g				New York	NS	Weight at metamorphosis can vary by 2 to 4 times between the smallest and largest individuals.
LENGTH AT METAMORPHOSIS													
Martof 1956b	-	B	-	-	32.6		mm SVL	28.4	36.3		s Michigan 1948-49	streams, ponds	Length measured from snout to vent (SVL).
Ryan 1953	-	-	-	-	26-38		mm SVL				New York 1949-50	streams, ponds	Length measured from snout to vent (SVL).
Ryan 1953	-	B	-	-			mm SVL	26	38		New York 1949-50	streams, ponds	Length measured from snout to vent (SVL).

***** DIET *****

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Bush 1959 (melanota)	A	B	carabidae		20.6			20	Kentucky 1955-56	stream - % wet volume; stomach contents	Items comprising less than 2% not listed here.
			brentidae		5.1						
			coccinellidae		5.1						
			cerambycidae		3.9						
			platypodidae		2.8						
			zontidae		30.0						
			unident. pulmonata		5.1						
			lepidoptera		5.1						
			hemiptera		3.9						
			astacidae		3.4						
			chilopoda		2.2						
			sand, rocks, gravel		4.4						
			unident., leaves		3.9						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Hamilton 1948 (melanota)	A	B	coleoptera		22.1			434	New York 1928-47	lakes, streams - % "by bulk"; stomach contents	27 - 97 mm SVL frogs collected from May - October; 83% collected during summer. Items comprising less than 1% not listed here.
			diptera		13.5						
			orthoptera		12.8						
			caterpillars		11.8						
			hymenoptera		7.4						
			arachnids		6.7						
			cast green frog skin		3.9						
			hemiptera		3.8						
			frogs		3.3						
			molluscs		3.1						
			crustacea		2.1						
			millipedes		1.5						
			lepidoptera (adults)		1.4						
Hamilton 1948 (melanota)	A	B	coleoptera		21.2			85	New York 1928-47	lakes, streams - % "by bulk"; stomach contents	Large (60-97 mm SVL) frogs collected from May - October; most collected during the summer. Items comprising less than 1% not listed here.
			caterpillars		17.4						
			orthoptera		16.7						
			amphibia		7.8						
			hymenoptera		6.9						
			diptera		4.3						
			molluscs		4.1						
			crustacea		3.4						
			arachnids		2.7						
			earthworms		2.1						
			lepidoptera (adults)		1.8						
			cast green frog skin		1.4						
			hemiptera		1.2						
			millipedes		1.0						
Jenssen & Klimstra 1966	B	B	mineral	-	-	-	2.6		s Illinois 1963-64	swamp, stream - % wet volume; stomach contents	Size of frogs not presented. Items comprising less than 3% in all seasons not listed here.
			plant	5.7	8.3	4.2	0.5				
			animal	94.3	91.7	95.8	96.8				
			pulmonata	(15.7)	(18.3)	(6.4)	(11.0)				
			oligochaeta	(2.1)	(0.8)	(2.3)	(6.4)				
			amphipoda	(1.2)	(0.1)	-	(4.6)				
			isopoda	(5.6)	(1.4)	-	(4.6)				
			decapoda	-	-	(4.1)	-				
			julioforma	(7.5)	(0.3)	(1.7)	-				
			araneida	(2.8)	(3.4)	(6.6)	(7.4)				
			odonata	(1.6)	(12.4)	(5.9)	-				
			orthoptera	(0.9)	(3.0)	(1.5)	-				
			hemiptera	(1.0)	(7.0)	(6.1)	(2.2)				
			coleoptera	(9.6)	(19.6)	(15.9)	(9.1)				
			lepidoptera	(25.4)	(7.0)	(25.1)	-				
			diptera	(6.0)	(5.2)	(4.5)	(10.3)				
			hymenoptera	(9.9)	(6.0)	(13.5)	-				
			salientia	-	-	(3.9)	-				
			sample size	*127*	*126*	*119*	*103*				

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Stewart & Sandison 1973	A	B	plant material		10.8			24	New York 1968	lake	Total = 103.3%. Season of collection not specified.
			araneae		12.1					-	
			coleoptera		32.8					% total volume;	
			hemiptera		12.9					stomach contents	
			hymenoptera		14.4						
			diptera		6.8						
			ephemeroptera		5.6						
			mollusca		5.4						
			lepidoptera		2.5						

***** POPULATION DYNAMICS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HOME RANGE SIZE													
Martof 1953b (melanota)	A	B	NB	-	0.0065	0.0036 SD	ha	0.0020	0.020	29	s Michigan 1948-49	stream banks, stream	Daily activity range of non-breeding frogs. Juveniles = subadults. Captured from May through October; adults left range for breeding.
	J	B	NB	-	0.0053	0.0024 SD	ha	0.0020	0.011	14			
Wells 1977 (melanota)	A	M	BR	SU	4.0-6.0		m shore				New York 1973-75	open nearshore areas	Defended breeding territory in open areas near the shores of shallow ponds.
Wells 1977 (melanota)	A	M	BR	SU	1.0-1.5		m shore				New York 1973-75	densely vegetated nearshore areas	Defended breeding territory in stands of dense bulrushes near the shores of shallow ponds.
POPULATION DENSITY													
Wells 1978 (melanota)	A	M	-	-	476		N/ha			21	New York 1973-77	artificial pond	Frogs initially hand-captured and placed in pond; the numbers given are for those frogs that stayed.
	A	F	-	-	567		N/ha			25			
CLUTCH SIZE													
Martof 1956a (melanota)	-	-	-	-	4,100		eggs	3,800	4,300	3	s Michigan 1948-49	pond	
Pope 1947 (melanota)	-	-	-	-			eggs	3,500	5,000		Illinois	shallow water	As cited in Martof 1956a.
Wells 1976 (melanota)	-	-	-	-			eggs	1,000	7,000		New York 1973-74	shallow ponds	Estimated from field counts and photographs.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Wright 1914 (melanota)	-	-	-	-			eggs	3,500	4,000		New York	shallow water	As cited in DeGraaf and Rudis 1983.
CLUTCHES/YEAR													
Wells 1976	-	-	1	-	2		N/year			10	New York	shallow ponds	(1) If the marked female was caught laying first clutch prior to July 21; (2) if caught laying clutch for the first time after July 21. Females caught for the first time after July 21 may have deposited a clutch at an earlier time in a different pond.
(melanota)	-	-	2	-	1		N/year			12	1973-74		
DAYS INCUBATION													
Babbitt 1937 (melanota)	-	-	-	-	3-6		days				Connecticut	shallow water	As cited in DeGraaf and Rudis 1983.
Martof 1956a (melanota)	-	-	-	-	3-5		days				s Michigan 1948-49	shallow ponds	
Ryan 1953	-	-	-	-	3-5		days				New York 1949-50	ponds, pools	Duration depends on water temperature.
TIME TO METAMORPHOSIS													
DeGraaf & Rudis 1983 (melanota)	-	-	-	-			years	1	2		New England	shallow water	
Martof et al. 1980	-	-	1	-	3		months				Virginia, Carolinas	shallow ponds	(1) Most tadpoles transform in a few months, (2) some overwinter.
	-	-	2	-	10-12		months						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Martof 1956a,b (melanota)	-	-	1	-	2.5-3		months				s Michigan 1948-49	shallow ponds	(1) Eggs laid prior to June; (2) eggs deposited later in the season.
	-	-	2	-	11-12		months						
Wright 1914	-	-	1	SP	3		months				New York	shallow ponds	(1) Eggs laid in spring; (2) eggs laid in summer. As cited in Pough and Kamel 1984.
	-	-	2	SU	10-12		months						
AGE AT SEXUAL MATURITY													
Martof 1956a,b (melanota)	A	M	-	-	1-2		years				s Michigan 1948-49	shallow ponds	Years after transformation. Individuals may reach maturity at the end of their first year but generally do not attempt to breed until the following year.
	A	F	-	-	1-2		years						
Ryan 1953	-	B	-	-	1-2		years				New York 1949-50	ponds, streams	Years after transformation. Transformation size and date influence when individuals attain adulthood.
Wells 1977 (melanota)	-	B	-	-	1		year				New York 1973-77	pond	Sexual maturity reached usually in one year after transformation, although some may not breed until the second year.
LENGTH AT SEXUAL MATURITY													
Martof 1956b	A	M	-	-	60-65		mm SVL				s Michigan 1948-49	streams, ponds	Length measured from snout to vent (SVL).
	A	F	-	-	65-75		mm SVL						
Ryan 1953	-	F	-	-	65		mm SVL				New York 1949-50	streams, ponds	Length measured from snout to vent (SVL).
	-	F	-	-	60		mm SVL						
LONGEVITY													
Martof 1956b	A	-	-	-			years			5	s Michigan 1948-49	streams, ponds	Approximate longevity in natural populations.

***** SEASONAL ACTIVITIES *****

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Martof 1956a (melanota)	May	earl Jul	mid Aug	s Michigan 1948-49	streams, ponds	

Reference	Begin	Peak	End	Location	Habitat	Notes
Mele 1980	lat May	June	mid Aug	New Jersey 1974-76	swamp	
Pough & Kamel 1984	lat spr		summer	New York	shallow ponds	
Ryan 1953	May	earl Jun	mid Aug	New York 1949-50	streams, ponds	
Smith 1961 (melanota)	May		Sep	Illinois	NS	
Wells 1976	earl Jun		mid Aug	New York 1973-74	shallow ponds	
METAMORPHOSIS TO ADULT						
Martof 1956a (melanota)	earl Aug	lat Aug	earl Oct	s Michigan 1948-49	streams, ponds	
Martof 1956b (melanota)	earl Aug		lat Sep	s Michigan 1948-49	streams, ponds	Eggs laid early in the season - metamorphosed in same year.
Martof 1956b (melanota)	earl Jun		mid Jul	s Michigan 1948-49	streams, ponds	Eggs laid late in the season - metamorphosed the following year.
Pough & Kamel 1984		Aug, Sep		New York	shallow ponds	For eggs laid in late spring.
Pough & Kamel 1984		next spring		New York	shallow ponds	For eggs laid in the summer.
Ryan 1953	May	Jun-Jul	lat Sep	New York 1949-50	streams, ponds	
HIBERNATION						
Martof 1956a (melanota)	Oct-Nov		Mar-Apr	s Michigan 1948-49	streams, ponds	
Ryan 1953	Oct		lat Mar	New York 1949-50	streams, ponds	
Smith 1961 (melanota)			Apr	NS	NS	

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT (AND LENGTH)													
Cohen & Howard 1958	-	B	-	-	20		g (54 mm)	(SVL)			California 1950-51	artificial ponds	Values based on a graph of the relationship between snout to vent length (SVL) and weight of 274 bullfrogs.
	-	B	-	-	60		g (82 mm)						
	-	B	-	-	100		g (101 mm)						
	-	B	-	-	140		g (112 mm)						
	-	B	-	-	180		g (117 mm)						
Durham & Bennett 1963	-	B	0	-	9		g (84 mm)	(total length)		48	e c Illinois 1941-53	impoundment	Total length measured. Age: (0) at metamorphosis (September); (1) - (6) at end of first - sixth years after metamorphosis. Length measurements are total length - from snout to toe tips. Author notes that snout to vent length (SVL) is about 0.42 - 0.43 of total length. Converted from pounds and inches.
	-	B	1	-	91		g (240 mm)			19			
	-	B	2	-	210		g (307 mm)			5			
	-	B	3	-	240		g (320 mm)			5			
	-	B	4	-	260		g (335 mm)			3			
	-	B	5	-	290		g (348 mm)			6			
	-	B	6	-	360		g (356 mm)			5			
Durham & Bennett 1963	A	-	-	-			g (366 mm)	(total length)	545		e c Illinois 1941-53	impoundment	Heaviest frog found; Total length measured (from snout to toe tips).
Farrar & Dupre 1983	J	B	1	SU	35.0	5.0 SE	g (76 mm)	(SVL)		13	Iowa	lake	Juvenile frogs in summer/fall following transition. (1) July 30; (2) Sept 4; (3) Sept 17; (4) Oct 2; (5) Oct 15. Length measured from snout to vent (SVL).
	J	B	2	FA	46.2	4.1 SE	g (83 mm)			12			
	J	B	3	FA	53.3	1.5 SE	g (87 mm)			8			
	J	B	4	FA	68.5	5.2 SE	g (98 mm)			9			
	J	B	5	FA	53.4	5.8 SE	g (90 mm)			11			
Fulk & Whitaker 1968	B	B	-	SU	158.8		g (104 mm)	(SVL)		111	Indiana 1966-68	strip-pit ponds with cattails and algae	Collected in June and July. Length measured from snout to vent (SVL).
Fulk & Whitaker 1968	B	B	-	SU	153.2		g (107 mm)			78	Indiana 1966-68	farm ponds in field	Collected in June and July. Length measured from snout to vent (SVL).
Fulk & Whitaker 1968	B	B	-	SU	373.7		g (175 mm)	(SVL)		178	Indiana 1966-68	river	Collected in June; length measured from snout to vent (SVL); are larger than those above because since they were caught in June, more females had eggs. The author suggests the river has less hunting pressure, so large frogs are more common than at the ponds.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
McAlpine & Dilworth 1989	B	-	-	-	142.8	77.4 SD	g (98 mm SVL)	9.5	274.0	39	New Brunswick, CAN 1984	marsh	Length in units column (from snout to vent - SVL) is a mean; range in lengths was 45 - 128 mm.
McKamie & Heidt 1974	A	B	-	SP	249		g (122 mm)	(SVL)		62	c Arkansas 1972	farm ponds	Length measured from snout to vent (SVL).
Modzelewski & Culley 1974	J	B	1	-	17.5		g	13.1	41.6		Louisiana 1971-72	lab	Age post-metamorphosis: (1) 1 month; (2) 2 months; (3) 3 months; (4) 4 months. Maintained at a temp of 24-27 C and fed a diet of mosquitofish, crickets and earthworms.
	J	B	2	-	29.8		g	18.5	51.6				
	J	B	3	-	42.4		g	27.6	77.2				
	J	B	4	-	55.8		g	40.5	100.8				
Viparina & Just 1975	T	B	1	SU	35.7	5.2 SD	g			67	Kentucky 1971-73	ponds	(1) July; tadpoles that overwintered; (2) July; new tadpoles.
	T	B	2	SU	2.0	1.1 SD	g			73			
BODY LENGTH													
Behler & King 1979	A	-	-	-			mm SVL	90	203		NS	NS	Length measured from snout to vent (SVL). Minimum is the approximate length at sexual maturity. Summarizing the work of others.
Behler & King 1979	T	-	-	-			mm total	102	171		NS	aquatic	Total length; summarizing the work of others.
Bruneau & Magnin 1980	-	B	1	-	59		mm SVL				Quebec, CAN	NS	Number in condition column is age of frog in years. As cited in Bury & Whelan 1984.
	-	B	2	-	81		mm SVL						
	-	B	3	-	108		mm SVL						
	-	B	4	-	125		mm SVL						
	-	B	5	-	137		mm SVL						
	-	B	6	-	143		mm SVL						
Conant & Collins 1991	A	-	-	-	90-150		mm SVL		203		e c North America	NS	Length measured from snout to vent (SVL).
Durham & Bennett 1963	-	B	0	-	84		mm total	76	89	48	ec Illinois 1941-52	impoundment	Total length (from snout to toe tips of back legs). Age: (0)=at metamorphosis (Sept.); (1)-(6)=at end of first through sixth years. Authors note that snout to vent length (SVL) is about 0.042-0.043 of total length. Converted from inches.
	-	B	1	-	240		mm total	200	270	19			
	-	B	2	-	307		mm total	290	325	5			
	-	B	3	-	320		mm total	318	323	5			
	-	B	4	-	335		mm total	335	338	3			
	-	B	5	-	348		mm total	340	363	6			
	-	B	6	-	356		mm total	345	366	5			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
George 1940	-	B	0	-	40		mm SVL				Louisiana	NS	(0) = length at metamorphosis. (1)-(2) are size class limits for frogs aged from 1 to 2 years after transformation. Measured during the "growing season" - spring to early fall. Length measured from snout to vent (SVL). As cited in Turner 1960.
	-	B	1	SP			mm SVL	44	82				
	-	B	1	FA			mm SVL	101	120				
	-	B	2	-			mm SVL	101	133				
George 1940	A	M	-	-			mm SVL		171		Louisiana	NS	As cited in Turner 1960.
	A	F	-	-			mm SVL		184				
Howard 1981a	A	M	1	SU	131.72	8.92 SD	mm SVL		151	58	Michigan	pond	Year: (1) 1975; (2) 1978.
	A	F	1	SU	142.63	11.91 SD	mm SVL		172	55	1975,78		
	A	M	2	SU	114.73	12.15 SD	mm SVL		140	30			
	A	F	2	SU	124.22	12.79 SD	mm SVL		154	23			
Martof et al. 1980	A	-	-	-			mm SVL	85	200		Carolinas, Virginia	aquatic	
Martof et al. 1980	T	-	-	-			mm total	125	150		Carolinas, Virginia	NS	Total length.
Raney & Ingram 1941	-	B	0	-	45		mm SVL				New York	NS	(0) = length at transformation. (1) - (4) are size class limits for frogs aged from 1 to 4 years after transformation. Measured during the "growing season" - spring to early fall. Length measured from snout to vent. As cited in Turner 1960.
	-	B	1	-			mm SVL	67	90				
	-	B	2	-			mm SVL	82	110				
	-	B	3	-			mm SVL	113	126				
	-	B	4	-			mm SVL	125	139				
	-	F	-	-					155				
BODY FAT													
Farrar & Dupre 1983	J	B	1	SU	7.6	3.1 SE	mg/g			13	Iowa	lake	Juvenile bullfrogs in the summer/fall following transformation. (1) July 30; (2) Sept 4; (3) Sept 17; (4) Oct 2; (5) Oct 15. Fat body weight as mg fat per gram body weight.
	J	B	2	FA	3.0	0.6 SE	mg/g			12			
	J	B	3	FA	1.1	0.3 SE	mg/g			8			
	J	B	4	FA	1.2	0.3 SE	mg/g			9			
	J	B	5	FA	2.4	0.8 SE	mg/g			11			
GROWTH RATE													
George 1940	A	B	1	-	4		yrs to 120				NS	NS	Years required to reach 120 mm (SVL) in length in: (1) northern US, (2) southern US. As cited in Bury and Whelan 1984.
	A	B	2	-	1.5-2		yrs to 120						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Raney & Ingram 1941; Treanor & Nichola 1972	A	B	-	-	9-18		mm/yr				NS	NS	Adults older than 4 years. As cited in Bury & Whelan 1984.
METABOLIC RATE (OXYGEN)													
Burggren et al. 1983	T	-	1	-	1.5	0.2 SE	lO2/kg-day				NS	lab	Restrained and cannulated tadpoles at (1) 15 C; (2) 25 C; and (3) 33 C. Mean weight = 5.7 g.
	T	-	2	-	2.6	0.2 SE	lO2/kg-day						
	T	-	3	-	5.4	0.7 SE	lO2/kg-day						
Glass et al. 1981	A	1	R	-	0.76	0.07 SE	lO2/kg-d			7	NS	lab	Resting (R) metabolism at: (1) T = 20 C; (2) T = 30 C; mean weight = 260 g in both cases.
	A	2	R	-	1.59	0.22 SE	lO2/kg-d			7			
Hutchinson et al. 1968	A	-	1	-	1.0		lO2/kg-day	0.31	2.3	9	NS	NS	Resting metabolism: (1) at 5 C; (2) at 15 C. Mean weight of frogs was 74.8 g.
	A	-	2	-	1.38		lO2/kg-day	1.05	1.56	4			
Weathers 1976	A	B	1	-	0.473	0.034 SE	lO2/kg-day			7	Louisiana	lab	All frogs weighed approximately 605-620 g. Acclimated for 2 weeks at 20 C then held at (1) 5 C; (2) 12 C; (3) 20 C; for 5 days fasting.
	A	B	2	-	0.794	0.038 SE	lO2/kg-day			7			
	A	B	3	-	1.28	0.050 SE	lO2/kg-day			8			
Weathers 1976	A	B	1	-	0.372	0.029 SE	lO2/kg-day			8	Louisiana	lab	All frogs weighed approximately 615-650 g. Acclimated for two weeks at 5 C then held at (1) 5 C; (2) 12.5 C; and (3) 20 C for 5 days fasting.
	A	B	2	-	0.624	0.043 SE	lO2/kg-day			8			
	A	B	3	-	0.912	0.062 SE	lO2/kg-day			8			
FOOD INGESTION RATE													
Farrar & Dupre 1983	J	B	-	SU	.027	0.008 SE	ml/g			13	Iowa	pond	Volume of food found in gastrointestinal tracts of recently transformed frogs.
	J	B	-	FA	0.00628	0.00183 SE	ml/g			40			
Frost 1935	A	-	-	SU	0.04	0.03 SD	g/g-day	0.005	0.10	48	NS	captive	Rough estimate based on the weight of frogs, nestling birds, insects and snails eaten by one 200 g captive frog. Value is likely to be on the high side because weight of food on days when ate only insects was not always reported. N = number of days from June-Sept. for which weight of food eaten was reported.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Modzelewski & Culley 1974	J	B	1	-	0.098		g/g-day			24	Louisiana 1971-72	lab	Frogs in year after transformation. Weight range: (1) 7.9-17.6 g; (2) 17.1-34.7 g; (3) 21.5-45.7 g. Temp. maintained between 24-27 C. Diet of mosquitofish.
	J	B	2	-	0.048		g/g-day			24			
	J	B	3	-	0.033		g/g-day			24			
Modzelewski & Culley 1974	J	B	1	-	0.071		g/g-day				Louisiana	lab	Frogs during year after transformation. Body weight ranges: (1) 13.1 g to 41.6 g; (2) 18.5 g to 51.6 g; (3) 27.6 g to 77.2 g; (4) 40.5 g to 100.8 g. Temp. maintained at 24-27 C. Mixed diets of mosquitofish, crickets and earthworms.
	J	B	2	-	0.059		g/g-day						
	J	B	3	-	0.040		g/g-day						
	J	B	4	-	0.033		g/g-day						

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Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Brooks 1964	A	B	Insecta		6			34	e Virginia 1958	pond in open pasture - % weight; gut contents	Collected June-November. Items comprising < 2% not included. Wet/dry weight not specified. Anuran prey include both adults and tadpoles.
			(Coleoptera)		(4)						
			Decapoda		3						
			Anurans		50						
			Serpentia		12						
			pebbles & sand		17						
			vegetative material		7						
			digested invertebrat		2						
			digested vertebrates		2						
Brooks 1964	A	B	Insecta		49			19	e Virginia 1958	pond in dense hardwoods - % weight; gut contents	Collected from June-November. Items comprising < 2% not included. Wet/dry weight not specified.
			(Coleoptera)		(8)						
			(Orthoptera)		(8)						
			(Hymenoptera)		(2)						
			(Odonota)		(6)						
			(Lepidoptera)		(24)						
			Aranae		3						
			Decapoda		19						
			vegetative material		22						
			digested invertebrat		6						
			pebbles, sand		1						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Bush 1959	A	B	Decapoda-Astacidae		47.7			18	Kentucky 1955-56	NS - % wet volume; stomach contents	Items comprising < 1% not included.
			Lepidoptera		19.0						
			Coleoptera		16.0						
			(Lampryidae)		(5.8)						
			(Chrysomelidae)		(5.8)						
			(Carabidae)		(4.1)						
			Pulmonata-Zonitidae		8.3						
			Chilopoda		7.7						
			sand,rock,gravel		1.2						
Carpenter & Morrison 1973	A	B	Odonata		17.8			28	nc Texas	ponds, impoundments - frequency of occurrence; stomach contents	All animals < 150 mm in total length (snout to back toes). Items with values less than 3 not included here.
			Hemiptera		10.7						
			Orthoptera		10.7						
			Hymenoptera		42.8						
			Coleoptera		50						
			Lepidoptera		17.8						
			Arachnida		10.7						
			Diptera		10.7						
			Diplopoda		3.5						
			Amphibia		3.5						
Carpenter & Morrison 1973	A	B	Odonata		8.6			46	nc Texas	ponds, impoundments - frequency of occurrence; stomach contents	All animals 151-300 mm in total length. Items with values less than three not included here.
			Hemiptera		13.0						
			Orthoptera		23.9						
			Hymenoptera		39.1						
			Coleoptera		63.0						
			Lepidoptera		28.2						
			Diptera		4.3						
			Crustacea		28.2						
			Diplopoda		10.8						
			Gastropoda		4.3						
			Amphibia		6.5						
			Osteicthyes		6.5						
Carpenter & Morrison 1973	A	B	Odonata		20			50	nc Texas	ponds, impoundments - frequency of occurrence; stomach contents	All animals > 300 mm in total length. Items with values less than 3 are not listed here.
			Hemiptera		12						
			Orthoptera		26						
			Hymenoptera		40						
			Coleoptera		40						
			Lepidoptera		24						
			Crustacea		8						
			Arachnida		14						
			Reptilia		6						
			Amphibia		16						
			Aves		4						
			Osteichthyes		4						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Cohen & Howard 1958	-	-	Coloeptera		43.6			300	California 1950-51	artificial ponds - % frequency of occurrence; stomach contents	Season not specified. Items comprising <3% not included here.
			Notonectidae		10.3						
			Diptera		6.6						
			Hymenoptera		6.3						
			Ephemeroptera		4.3						
			Protura		3.3						
			decomposed tissue		18.0						
			spiders, Lycosidae		16.0						
			unidentified insect		21.3						
			rocks, grass, leaves bark		22.0						
			chitinous material		10.0						
			snails, Planorbid		9.0						
			frogs		5.6						
			snails, Physid		4.7						
			small fish		4.3						
Corse & Metter 1980	A	B	frogs	35	33	39			Missouri 1972-73	bait minnow pond - Number of items; stomach contents	Sample size = number of stomachs containing food. Spring = combined totals from May 1972 and Mar-Apr 1973; Summer = June-Aug 1973; and Fall = Sept 1973. Items found <5 times in all seasons not included. These included mammals, snakes, toads, Chilopoda, adult Diptera, Hymenoptera, and Hirudinea.
			tadpoles	8	11	0					
			shiners	305	157	25					
			other fish	7	2	5					
			Gastropoda	55	70	26					
			crayfish	22	162	18					
			other crustacea	71	42	47					
			Arachnida	3	23	3					
			Coloeptera-adult	31	33	15					
			Diptera larvae	2	7	0					
			Hemiptera	41	43	16					
			(sample size)	(164)	(175)	(84)					
Farrar & Dupre 1983	J	B	Diplopoda		4	1.5			Iowa	lake - % number of items; gastrointestinal tract	Juvenile bullfrogs (transformed that summer) collected on July 30 and from September through mid October.
			Gastropoda		11.8	3.0					
			Arachnida		1.3	1.1					
			Crustacea		1.3	-					
			Odonata		22.4	21.6					
			Orthoptera		6.6	5.8					
			Hemiptera		15.8	33.8					
			Diptera		1.3	-					
			Coleoptera		14.5	17.3					
			Hymenoptera		10.5	12.6					
			Lepidoptera		10.5	2.3					
			other			1					
			(sample size)		(13)	(40)					
Fulk & Whitaker 1968	-	B	Ranid tadpoles		20.0			78	Indiana 1966-68	farm ponds in pastures - % volume; stomach contents	Collected in June & July. Items comprising < 2.5% not included. Frogs averaged 107.2 mm SVL and 153.2 g.
			crayfish		14.8						
			Libellulidae		10.4						
			Lepidoptera		4.7						
			young Rana sp.		3.9						
(continued)			Aeschvidae		3.9						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Fulk & Whitaker 1968 (continued)			Scarabaeidae		3.5						
			Formicidae		3.3						
			Hyla versicolor		2.6						
			Odonata naiads		2.6						
Fulk & Whitaker 1968	-	B	crayfish		21.3			111	Indiana 1966-68	strip pit-ponds - % volume; stomach contents	Collected in June, July. Items comprising <2.5% not included here. Frogs averaged 103.5 mm SVL and 158.8 g.
			Lepidoptera		10.5						
			spiders		7.7						
			vegetation		7.0						
			Dystiscidae		5.8						
			Libellulidae		5.4						
			Rana sp.		3.9						
			Lepid larvae		3.6						
			Aeschnidae		2.7						
Fulk & Whitaker 1968	-	B	Scarabaeids		14.2			178	Indiana 1966-68	river - % volume; stomach contents	Collected in June. Items comprising <3% not included. Frogs averaged 373.7 g and 174.8 mm SVL.
			crayfish		12.3						
			Lucanids		9.6						
			terrestrial snails		8.2						
			earthworms		7.1						
			carabids		6.8						
			aquatic snails		6.5						
			spiders		5.3						
			minnows		4.8						
			Diplopoda		3.6						
Hammer & Linder 1971	A	B	frog		76.1			40	South Dakota 1967	pond - % dry weight; stomach contents	"Large" bullfrogs.
			crayfish		11.2						
			debris		3.2						
			giant water bug		2.8						
			vegetation		2.6						
			water scorpion		1.4						
			odonata		0.9						
			snail		0.5						
			other		1.3						
Korschgen & Baskett 1963	A	B	crayfish		31.6			278	Missouri 1958-59,61	shallow impoundment - % dry volume; stomach contents	Frogs collected from May-Sept. Items comprising <2% not included. Both adult and nymph dragonflies are consumed.
			meadow vole		11.7						
			dragonflies		8.1						
			frogs		6.2						
			watersnakes (Natrix)		3.9						
			ground beetles		3.3						
			water scavenger beet		2.7						
			bluegill		2.5						
			spiders		2.5						
			diving beetles		2.4						
			scarab beetles		2.1						
			darkling beetles		2.0						
			vegetation, leaves,		3.1						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Korschgen & Baskett 1963	A	B	crayfish		39.2			130	Missouri 1958-59	streams - % dry volume; stomach contents	All frogs collected in June. Items comprising < 2% of volume not included.
			cicadas		15.8						
			ground beetles		7.8						
			scarab beetles		5.0						
			white-faced mouse		4.5						
			caterpillars, moths		3.3						
			tadpoles		3.2						
			dragonfly nymphs & a		3.0						
			frogs		2.7						
			hellgrammites		2.2						
			five-lined skink		2.1						
			spiders		2.1						
Korschgen & Moyle 1955	A	B	insects		32.6			455	c Missouri 1950-51	farm ponds - % dry volume; stomach contents	Collected from April-October. As cited in Korschgen & Baskett 1963.
			crustaceans		26.4						
			amphibians, reptiles		24.5						
			misc. invertebrates		3.3						
			mammals		3.0						
			fishes		2.8						
			other		7.4						
McKamie & Heidt 1974	A	B	Decapoda (crayfish)	43.2				62	c Arkansas 1972	pond - % dry weight; stomach contents	Mean size of frogs: 122 mm SVL, 249 g. Items comprising less than 2% not listed. 0.9% unaccounted for.
			Hydrophilidae	3.1							
			Lepidoptera larvae	2.3							
			other inverts	8.5							
			Pimphales sp.	5.1							
			Notemigonus sp.	8.6							
			Rana sp. (adults)	19.4							
			Natrix sp.	2.9							
			Chelydra serpentina	2.4							
			plants	1.9							
McKamie & Heidt 1974	A	B	Decapoda (crayfish)	36.7				29	c Arkansas 1972	strip pits - % dry weight; stomach contents	Mean size of frogs = 140 mm SVL, 252 g. Total exceeds 100% (i.e., 117%), which may indicate that there is a misprint in the values. Items comprising less than 2 % not listed.
			Coleoptera adult	6.2							
			Lepidoptera adult	4.9							
			Lepidoptera larvae	6.5							
			other inverts	14.3							
			Notropis sp.	6.4							
			Lepomis sp.	4.8							
			Rana & Hyla sp.	2.8							
			Pseudemys scripta	27.9							
			plants	7.2							

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
McKamie & Heidt 1974	A	B	Gastropoda	3.3				48	c Arkansas 1972	river, stream - % dry weight; stomach contents;	Mean size of frogs: 119 mm SVL, 251 g. Items comprising less than 2% not listed; 7.6% unaccounted for in original.
			Decapoda	42.6							
			Corixidae	4.2							
			other insects	16.5							
			Urodela	2.4							
			birds	1.6							
			Blarina brevicauda	7.7							
			acorns	4.7							
			unidentified plant	9.4							
Stewart & Sandison 1973	A	B	plant		19.7			21	New York 1968	mountain lake - % volume; stomach contents	Collected during July.
			animal		65.2						
			(Odonata)		(8.8)						
			(Coleoptera)		(15.8)						
			(Hemiptera)		(0.5)						
			(Hymenoptera)		(2.2)						
			(Amphibia)		(26.4)						
			unaccounted		15.1						
Tyler & Hoestenbach 1979	A	B	Osteichthyes		10			307	sw Oklahoma 1973-76	pond - % weight; digestive tract contents	Caught in June - September 1975, May - August 1976, and June - November 1973.
			Crustacea		6						
			Odonata		2						
			Orthoptera		23						
			Hemiptera		19						
			Diptera		2						
			Coleoptera		34						
			Hymenoptera		2						
			other		2						
Tyler & Hoestenbach 1979	A	B	Mollusca		2			307	sw Oklahoma 1975-76	stream - % weight; digestive tract contents	Caught in June - September 1975 and May - August 1976.
			Crustacea		73						
			Odonata		1						
			Orthoptera		3						
			Hemiptera		0.5						
			Coleoptera		16						
			Hymenoptera		.5						

***** POPULATION DYNAMICS *****

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HOME RANGE SIZE													
Currie & Bellis 1969	A	M	NB	-	2.9		m radius	0.76	11.3	65	Ontario, CAN 1960-61	pond	Mean activity radius for frogs captured 5 or more times in August and September.
	A	F	NB	-	2.4		m radius	0.61	10.2	66			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Currie & Bellis 1969	A	B	1	-	2.5		m radius	0.61	10.2	88	Ontario, CAN 1960-61	pond	Mean activity radius for frogs captured 5 or more times in August and September. Year (1) 1960 - population density 1,376 frogs/ha; (2) 1961 - density 892/ha.
	A	B	2	-	3.5		m radius	1.1	11.3	43			
Emlen 1968	A	M	BR	SU	2.7		m radius			94	Michigan 1965-66	pond	Measured in June, when defended as breeding territory. Based on average distance between frogs in pond of 5.4 m +/- 1.8 S.D.
POPULATION DENSITY													
Cecil & Just 1979	T	B	1	FA	70,000		N/ha				Kentucky 1975-76	Fred Pond	Population that emerges from eggs in summer and overwinters in the pond, emerging between July and September of the next year. Month of estimate: (1) September (newly hatched only); (2) January; (3) May.
	T	B	2	WI	29,000		N/ha						
	T	B	3	SP	16,000		N/ha						
Cecil & Just 1979	T	B	1	FA	130,000		N/ha				Kentucky 1974-75	Coldstream Pond	Population that emerges from eggs in summer and overwinters in the pond, emerging between July and September of the next year. Month of estimate: (1) November; (2) March; (3) May.
	T	B	2	SP	69,000		N/ha						
	T	B	3	SP	42,000		N/ha						
Clarkson & DeVos 1986	A	B	-	SU	9.1		N/km			3	AZ, CA 1981	river banks	Number of frogs observed per km of the Colorado River (both banks). Does not include frogs in backwaters further than 5 m inland. N = the number of surveys conducted.
Currie & Bellis 1969	B	B	1	-	1,376		N/ha			115	Ontario, CAN 1960-61	pond	Density of frogs on study pond in (1) 1960; (2) 1961. N = population size. Pond was smaller in 1961 than in 1960.
	B	B	2	-	892		N/ha			50			
Emlen 1968	B	B	-	SU	100		N/ha				Michigan 1965-66	pond	Approximate density found at a 2 ha pond.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
CLUTCH SIZE													
							(female size)						
Howard 1978a	-	-	1	-	10,200		(120 mm SVL)				Michigan 1975-76	pond	Length in units column (from snout to vent - SVL) is the size of the female; estimated from regression equation. Clutch: (1) first; (2) second.
	-	-	1	-	13,900		(130 mm SVL)						
	-	-	1	-	18,500		(140 mm SVL)						
	-	-	2	-	7,800		(130 mm SVL)						
	-	-	2	-	10,200		(140 mm SVL)						
Martof et al. 1980	-	-	-	-	12,000		eggs				Carolinas, Virginia	NS	
McAuliffe 1978	-	-	1	-	16,640		eggs			1	Nebraska	NS	Female lengths were (1) 128 mm SVL (2) 179 mm SVL; as cited in Bury and Whelan 1984.
	-	-	2	-	47,840		eggs			1			
Ryan 1980	-	-	-	-	7,360	741.7 SE	eggs			36	New Jersey 1976-77	pond	Mean snout to vent length of females was 140 mm.
Smith 1956	-	-	-	-			eggs	10,000	20,000		Kansas	NS	
Wright 1914	-	-	-	-			eggs	12,000	20,000		New York	NS	As cited in DeGraaf and Rudis 1983.
CLUTCHES/YEAR													
Emlen 1977	-	-	-	-	1		93% of fem.			68	Michigan 1966	pond	Incidence of double clutching based on the number of marked females captured two different times with eggs; estimates the clutches were three weeks apart.
	-	-	-	-	2		7% of fem.			5			
Howard 1978a	-	-	-	-	1-2		/yr				Michigan 1975-76	pond	Females at least 2 years past metamorphosis (>130 mm SVL) can produce a second clutch.
DAYS INCUBATION													
Clarkson & DeVos 1986	-	-	-	-	2-4		days				AZ, CA 1981	river	
Howard 1978b	-	-	-	-	2-4		days				Michigan 1975-76	pond	Based on own data and Collins 1975.
Martof et al. 1980	-	-	-	-	5		days				Carolinas, Virginia	NS	
Oliver 1955	-	-	-	-	5-20		days				NS	NS	As cited in DeGraaf and Rudis 1983.
Smith 1956	-	-	-	-	4-5		days				Kansas	NS	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Wright 1914	-	-	-	-	4		days				New York	NS	As cited in DeGraaf and Rudis 1983.
TIME TO METAMORPHOSIS													
Bleakney 1952	-	B	-	-	3		years				Nova Scotia, CAN	NS	As cited in Bury and Whelan 1984.
Cecil & Just 1979	-	B	-	-	1		year				Kentucky 1974-76	shallow ponds	Overwinter as larvae and metamorphose between July and September.
Cohen & Howard 1958	-	B	-	-			months	6-7			California 1950-51	reservoirs	In artificial ponds that often dried up before the end of summer.
Collins 1979	-	B	-	-	1-2		years				Michigan 1972-74	pond	
Corse & Metter 1980	-	-	-	-			years	1	2		Missouri 1972-73	stock pond	About half of the tadpoles from one egg mass introduced in June transformed the next June at 31 mm SVL; the other half would have taken two years but pond went dry first.
Corse & Metter 1980	-	-	-	-			months	3.5	12		Missouri 1972-73	hatchery pond	About half of the tadpoles from one egg mass introduced into hatchery pond on June 27 with abundant food for the fish transformed in mid Sept. of same year; the rest transformed the next June. Size at transformation = 34 mm SVL in Sept, 44 mm SVL in June.
Durham & Bennett 1963	-	B	-	-	23-25		months				Illinois	NS	As cited in Collins 1979.
George 1940	-	B	-	-	4-6		months				Louisiana	NS	As cited in Collins 1979.
Gibbons & Semlitsch 1991	-	-	-	-			months	4-5	12-13		S Carolina	ponds	
Martof et al. 1980	-	B	-	-	1		year				Carolinas, Virginia	NS	
Ryan 1953	-	B	-	-	2-3		years				New York 1949-51	NS	
Smith 1956	-	-	-	-	1		year				Kansas	NS	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Viparina & Just 1975	-	B	-	-	12-14		months	3-4			Kentucky 1971-73	ponds	A small percent (3-5%) transform after 3-4 months.
Willis et al. 1956	-	B	-	-	1		year				Missouri 1952-53	ponds	
Wright 1914	-	B	-	-	2-3		years				New York	NS	As cited in Willis et al. 1956.
AGE AT SEXUAL MATURITY													
DeGraaf & Rudis 1983	-	-	-	-			years	4	5		New England	aquatic	From time of hatching.
Dowe 1979	-	B	1	-	1		year				Arizona	NS	Years after metamorphosis: (1) adults which metamorphosed in fall following hatching; (2) adults which overwintered as larvae and metamorphosed in spring; as cited in Clarkson and DeVos 1986.
	-	B	2	-	2		years						
George 1940	-	B	-	-	2		years				Louisiana	NS	Years after metamorphosis; as cited in Turner 1960.
Howard 1978a	-	M	-	-	1		years				Michigan 1975-76	pond	Years after metamorphosis based on author's own data and Collins 1975.
	-	F	-	-	1-2		years						
Raney & Ingram 1941	-	B	-	-	2-3		years				New York	NS	Years after metamorphosis; as cited in Bury and Whelan 1984.
Ryan 1953	-	B	-	-	1-2		years				New York 1949-51	NS	Years after transformation.
MORTALITY													
Cecil & Just 1979	T	B	-	-	85.5		% tadpoles	82.4	88.2	3	Kentucky 1974-76	shallow ponds	% Mortality prior to metamorphosis; metamorphized after about one year in the pond. Min and max are the range found in different ponds/years.
Howard 1981a	A	M	-	-	79		%/winter			52	Michigan 1975-76	pond	Percent of number at end of breeding season (1975) not returning in spring (1976).
	A	F	-	-	80		%/winter			54			
Howard 1981a	A	M	-	-	88		%/winter			25	Michigan 1977-78	pond	Percent of number at end of breeding season (1977) not returning in spring (1978).
	A	F	-	-	92		%/winter			26			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Howard 1984	A	M	1	-	58		%/yr				Michigan 1975-76	pond	Mortality from age (in years) listed in condition column to the next year.
	A	M	2	-	58		%/yr						
	A	M	3	-	48		%/yr						
	A	M	4	-	77		%/yr						

LONGEVITY

Howard 1978b	A	B	-	-			years		5-8		Michigan	ponds	Rough estimate.

***** SEASONAL ACTIVITIES *****

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Behler & King 1979	Feb		Oct	southern range NA	NS	
Clarkson & DeVos 1986	Apr	May	late Jun	CA,AZ 1981	river	
Culley (pers. comm.)	Mar		Sep	Louisiana	NS	As cited in Bury and Whelan 1984.
DeGraaf & Rudis 1983; Behler & King 1979	late May	Jul	Jul	northern range	aquatic	
Durham & Bennett 1963	May		Jun	e c Illinois 1941-53	impoundment	
Ryan 1980	Apr 21		Jun 18	New Jersey	pond	
Ryan 1953	late Jun		earl Jul	New York 1949-51	NS	
Smith 1961	late Apr		Aug	Illinois	NS	
Smith 1956		May		Kansas	NS	
Storer 1922	Apr		late Jul	California	NS	As cited in Bury and Whelan 1984.
Viparina & Just 1975		Jun-July		Kentucky 1971-73	pond	
Willis et al. 1956	May	late Jun	Aug	Missouri 1950-54	farm ponds	

Reference	Begin	Peak	End	Location	Habitat	Notes
Wright & Wright 1949	late Jun		late Jul	New York	NS	As cited in Bury and Whelan 1984.
METAMORPHOSIS TO ADULT						
Cecil & Just 1979	July		Sept	Kentucky 1974-76	shallow ponds	After spending about one year as a tadpole.
Clarkson & DeVos 1986	Aug		Oct	CA, AZ 1981	river	Young of first clutches and some from second clutches that metamorphose in the year that they hatch.
Clarkson & Devos 1986	Mar		Apr	CA, AZ 1981	river	Young (of second clutches) which overwintered.
Collins 1979	late Jun		late Sep	Michigan 1972-74	pond	
Ryan 1953	July		Sept-Oct	New York 1949-51	NS	
Viparina & Just 1975		Jun-Aug		Kentucky 1971-73	pond	
Willis et al. 1956	Jun	late Jun-Aug	earl Oct	Missouri 1950-54	farm ponds	
HIBERNATION						
Durham & Bennett 1963	late Oct		late Mar	e c Illinois 1941-53	impoundment	
Ryan 1953	Oct-Nov		Apr-May	New York 1949-51	NS	Smaller frogs seem to emerge earlier and start hibernating later than large frogs.
Smith 1956			mid Feb	Kansas	NS	Earliest emergence from hibernation.
Willis et al. 1956	mid Oct		Mar	Missouri 1950-54	farm ponds	
Wright 1914	mid Oct		May	New York	NS	As cited in DeGraaf and Rudis 1983.